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[Claim(s)]
[Claim 1] The bioactive substance enclosure particulates which the porosity substance was made to adsorb around bioactive substance particles, and were closed with the substance [still particle / substance / said / porosity / on it].
[Claim 2] The bioactive substance enclosure particulate according to claim 1 characterized by for a porosity substance being porosity calcium carbonate, a porosity cellulose, or a porosity dextrin, and a particle substance being particle calcium, a particle cellulose, or a particle dextrin.
[Claim 3] The bioactive substance enclosure particulate according to claim 1 characterized by for a porosity substance being porosity calcium carbonate and a particle substance being milk-serum calcium.
[Claim 4] The bioactive substance enclosure particulate according to claim 3 characterized by the ratio of porosity calcium carbonate and milk-serum calcium being 1:2.
[Claim 5] The bioactive substance enclosure particulate according to claim 1 or 2 characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium.
[Claim 6] The bioactive substance enclosure particulate according to claim 1, 2, 3, 4, or 5 characterized by a bioactive substance being oiliness.
[Claim 7] The manufacture method of the bioactive substance enclosure particulates characterized by making a porosity substance stick to a bioactive substance, making a substance [particle / substance / said / porosity] adhere to the surface or gap, and making it adhere with an adhesive agent.
[Claim 8] The manufacture method of the bioactive substance enclosure particulate according to claim 7 characterized by for a porosity substance being porosity calcium carbonate, a porosity cellulose, or a porosity dextrin, and a particle substance being calcium.
[Claim 9] The manufacture method of the bioactive substance enclosure particulate according to claim 7 characterized by for a porosity substance being porosity calcium carbonate and a particle substance being milk-serum calcium.
[Claim 10] The manufacture method of a bioactive substance enclosure particulate according to claim 9 that the ratio of porosity calcium carbonate and milk-serum calcium is characterized by being 1:2.
[Claim 11] The manufacture method of the bioactive substance enclosure particulate according to claim 7 characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium.
[Claim 12] The manufacture method of the bioactive substance enclosure particulate according to claim 7, 8, 9, 10, or 11 characterized by a bioactive substance being oiliness.

[Claim 13] The bioactive substance enclosure particulates which took up with the substance [particle / substance / said / said porosity substance and/or / porosity] the surface or the gap of the porosity substance which adsorbed the water-soluble bioactive substance.
[Claim 14] The bioactive substance enclosure particulate according to claim 13 characterized by for a porosity substance being porosity calcium carbonate, a porosity cellulose, or a porosity dextrin, and a particle substance being calcium.
[Claim 15] The bioactive substance enclosure particulate according to claim 13 characterized by for a porosity substance being porosity calcium carbonate and a particle substance being milk-serum calcium.
[Claim 16] The bioactive substance enclosure particulate according to claim 15 characterized by the ratio of porosity calcium carbonate and milk-serum calcium being 1:2.
[Claim 17] The bioactive substance enclosure particulate according to claim 13 characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium.
[Claim 18] When a bioactive substance is a water-soluble substance, beforehand some water-soluble substances Porosity calcium carbonate, After making it stick to a porosity cellulose or a porosity dextrin and carrying out disintegration, The remaining porosity calcium carbonate, porosity celluloses, or porosity dextrins are made to stick to this electrostatically. Furthermore, the manufacture method of the bioactive substance enclosure particulates characterized by making calcium [particle / dextrin / said porosity calcium carbonate, a porosity cellulose, or / porosity] adhere to the surface or gap, and making it adhere to it with an adhesive agent.

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a bioactive substance enclosure particulate and its manufacture method.
[0002]
[Description of the Prior Art] In medicine or food, an unstable thing, the thing which has bitter taste and off-flavor, the thing which absorptivity is low when prescribing a medicine for the patient or taking in in taking orally, or is easy to produce decomposition within the stomach, etc. exist physically and chemically. In order to solve this, it encloses into a capsule, or a policy, such as giving combination of correctives and various kinds of coating, is devised. However, these were unsuitable for using as a material for processed foods low [absorptivity] in sensing difficulty for administration.
[0003] this invention person etc. developed the method of enclosing an oily bioactive substance by calcium particles etc. as a method of solving the above-mentioned fault (JP,H7-328416,A). However, the application to the drugs that it is required that a heart substance should have restriction and drug effect should continue also by this method in the living body for a long time etc. was difficult.
[0004] Then, porosity calcium husks were formed and it developed introducing substances arbitrary as a heart substance into an inside so that this invention person etc. could apply, no matter what thing a heart substance might be (JP,H10-5577,A). however, resistance to pressure with a low heat-resisting property with little quantity which can also introduce this method as a heart substance is low -- it is -- it is -- there was a fault, like kneading-proof nature is low. For this reason, when disintegration of a water-soluble unstable bioactive substance like vitamin C was carried out with the conventional technology, and it is processed into a pellet and made into the pellet for feed by an extruder, since a heat-resisting property

and resistance to pressure are not enough, an active substance is deactivated, and the original purpose cannot be attained in many cases. Moreover, since there were not a heat-resisting property and kneading-proof nature when an oil-soluble bioactive substance like DHA (docosa-hexaenoic acid) content refining fish oil is mixed to baker's dough and it is processed into a bread, oxidization of the oil progressed and, sensuously, the good thing was not obtained. Then, formation of the high porosity husks of a heat-resisting property, resistance to pressure, and kneading-proof nature is desired.
[0005]
[Problem(s) to be Solved by the Invention] This invention makes a technical problem formation of the high porosity husks of a heat-resisting property, resistance to pressure, and kneading-proof nature.
[0006]
[Means for Solving the Problem] this invention person found out that it was solvable by making porosity calcium carbonate, a porosity cellulose, or starch stick to a bioactive substance, and making particle calcium [milk-serum calcium or egg shell calcium] calcium adhere to the surface or gap as a result of trying hard wholeheartedly that said technical problem should be solved.
[0007] That is, this invention is (1). A porosity substance is made to adsorb around bioactive substance particles. Furthermore, the bioactive substance enclosure particulates closed with the substance [particle / substance / said / porosity] on it, (2) A porosity substance is porosity calcium carbonate, a porosity cellulose, or a porosity dextrin. The bioactive substance enclosure particulates given in (1) characterized by a particle substance being particle calcium, a particle cellulose, or a particle dextrin, (3) Bioactive substance enclosure particulates given in (1) characterized by for a porosity substance being porosity calcium carbonate and a particle substance being milk-serum calcium, (4) The bioactive substance enclosure particulates given in (3) characterized by the ratio of porosity calcium carbonate and milk-serum calcium being 1:2, (5) (1) or the bioactive substance enclosure particulates given in (2) which are characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium, [0008] (6) (1), (2) which are characterized by a bioactive substance being oiliness, A porosity substance is made to stick to (3), (4) or bioactive substance enclosure particulates given in (5), and (7) bioactive substances. A substance [particle / substance / said / porosity] is made to adhere to the surface or gap. The manufacture method of the bioactive substance enclosure particulates characterized by making it adhere with an adhesive agent, (8) A porosity substance is porosity calcium carbonate, a porosity cellulose, or a porosity dextrin. The manufacture method of the bioactive substance enclosure particulates given in (7) characterized by a particle substance being calcium, (9) The manufacture method of the bioactive substance enclosure particulates given in (7) characterized by for a porosity substance being porosity calcium carbonate and a particle substance being milk-serum calcium, (10) The manufacture method of bioactive substance enclosure particulates given in (9) that the ratio of porosity calcium carbonate and milk-serum calcium is characterized by being 1:2, [0009] (11) The manufacture method of the bioactive substance enclosure particulates given in (7) characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium, (12) (7), (8) which are characterized by a bioactive substance being oiliness, (9), (10), or the manufacture method of bioactive substance enclosure particulates given in (11), (13) The bioactive substance enclosure particulates which took up with the substance [particle / substance / said / said porosity substance and/ or / porosity] the surface or the gap of the porosity substance which adsorbed the water-soluble bioactive substance, (14) A porosity substance is porosity calcium carbonate, a porosity cellulose, or a porosity dextrin. The bioactive substance enclosure particulates given in (13) characterized by for the

bioactive substance enclosure particulates given in (13) characterized by a particle substance being calcium and (15) porosity substances being porosity calcium carbonate, and a particle substance being milk-serum calcium, [0010] (16) The bioactive substance enclosure particulates given in (15) characterized by the ratio of porosity calcium carbonate and milk-serum calcium being 1:2, (17) The bioactive substance enclosure particulates given in (13) characterized by for a porosity substance being a porosity cellulose and a particle substance being egg shell calcium, When a bioactive substance is a water-soluble substance, beforehand some water-soluble substances (18) Porosity calcium carbonate, After making it stick to a porosity cellulose or a porosity dextrin and carrying out disintegration, The remaining porosity calcium carbonate, porosity celluloses, or porosity dextrins are made to stick to this electrostatically. Furthermore, calcium [particle / dextrin / said porosity calcium carbonate, a porosity cellulose, or / porosity] is made to adhere to the surface or gap, and it is related with the manufacture method of the bioactive substance enclosure particulates characterized by making it adhere with an adhesive agent.

[0011] [the fundamental design for this invention] as this invention person indicated to JP,H7-328416, A If an oily bioactive substance and water are made to mix and emulsify and high-speed churning of this emulsification thing is carried out, an oil droplet will act as a kind of solid. If the solid particulates which are smaller than an oil droplet and bring about a charge opposite to the charge on the surface of an oil droplet are added while it produces, and F-potential carries out electrostatic electrification and is in this state on the surface of an oil droplet as a result of relative motion with water By using the principle that the oil droplet surface is adsorbed, there is the particulate concerned in having found out that an oily bioactive substance could be enclosed by solid particulates.

[0012] Even if it stores a success, using DHA (docosa-hexaenoic acid) and EPA (eicosapentaenoic acid) content refining fish oil first as an oily bioactive substance as a heart morphogenetic substance and is a water-soluble bioactive substance After covering with the sodium arginine solution which added the surface-active agent (a lecithin, yogurt powder, etc. are desirable when taking operating safety etc. into consideration) For example, it also became clear by carrying out a suspension to hydrogenated oil and subsequently making it solidify as particulates by cooling that it could be used as a heart substance and could be used as a heart substance by making hydrogenated oil etc. distribute a still more powdered thing. In addition, as other heart substances, antibiotics, such as oily bioactive substances, such as beta-carotene, erythromycin, and a mitomycin, heme iron, germ oil, vitamin A, E, etc. can be illustrated.

[0013] As a result of repeating examination about the solid particulates which constitute the husks for heart substance enclosure, it became clear that calcium particles were desirable in considering the stability after husks formation, the safety to a human body, etc. As calcium particles, inorganic calcium material, such as shell impalpable powder, such as powdered bones of a cow or a pig, an oyster, and a scallop, and calcium carbonate, can be used. However, only with calcium powder, even if it once formed husks, electric potential fell into the process and it became clear that an electrovalent bond might go out and break.

[0014] Then, since lactalbumin had calcium and fatty acid, and coordinate bond ability when using the milk calcium powder containing lactalbumin as a result of adding examination further as a solid particulate, it became clear that stable husks could be formed. If lactalbumins, such as casein, are used together or sodium arginine is used together even if it is powdered bones, above-mentioned shell impalpable powder, or above-mentioned inorganic calcium material, stable calcium husks can be formed.

[0015] This invention is characterized by providing the following. [the basic structure of the particle microcapsule which is what repeated improvement and this invention offers on the above-mentioned fundamental plan] Porosity organicity [inorganic matter with void volume high as a husks substance which includes the bioactive substance used as a heart substance which carried out Special Working Machinery Sub-Division of calcium, a cellulose, the dextrin, etc. and organicity] particulates, i.e., porosity calcium, a porosity cellulose, and a porosity dextrin Furthermore, calcium [particle / object / above-mentioned / for cheating out of husks with a precise structure / cavernous]

[0016] Furthermore, the substance which consists of the milk-serum protein, gelatin, the carragheenan, the guar gum, sodium arginine, and other polysaccharide which are an anchorage substance for fixing a shell structure object also serves as a constituent factor. Moreover, when the substance to include is an oily bioactive substance, the emulsifier for the oil droplet formation under underwater and a thickener also serve as a constituent factor. Since a gas fills the gap of a cavernous object, thermal conductivity can become low, and a dynamic buffer effect can become high, and porosity organicity [inorganic matter with high void volume and organicity] particulates can protect a bioactive substance from external pressure and heat, and can maintain stability.

[0017] However, since it was porosity structure, the form was uneven an infinite form and often, and the gap was easy to be formed in the particles, and it was dissatisfied in respect of precise nature. Then, this invention person etc. found out being protected from external environment, such as pressure and heat, when calcium and starch particle [porosity / this] make up for and elaborated the gap of the particles which have cavernous structure. Moreover, being protected also from decomposition by oxidization with air, inactivation, or an acidic solution by this elaboration also found out.

[0018] In addition, say a particle substance here and particle calcium, a particle cellulose, and a particle dextrin [calcium / still particle] For example, what is necessary is just particles, such as milk-serum calcium, egg shell calcium, shell calcium, cow bone powder calcium, sea urchin husks calcium, fishbone powder calcium, or a natural mineral material of vegetable origin. If the particle diameter of particle calcium is 1/2 or less [of the particle diameter of a husks substance], it is satisfactory, but about 1/10 is more desirable.

[0019] Moreover, although about 1:2 are the most desirable as for the addition ratio of a husks substance and particle calcium, when required as the characteristic of a final product, a ratio can be changed suitably. Furthermore, in order to adjust the decay conditions according to the use of this structure, you can also make it to use an adhesive agent, since a shell structure object is fixed, but solidify by an anchorage substance. For example, under acidity, it is solvable using an acid-proof thing for an anchorage substance by drugs with much necessity of tolerance being shown and making it dissolving under alkalinity.

[0020] Although gelatin, carragheenan, a guar gum, sodium arginine, etc. are used and it is desirable as an adhesive agent to add gradually the thing made to dissolve beforehand after particle calcium addition as for addition of an adhesive agent, you may add with fine particles, and even if it adds at the time of emulsification, it does not interfere. Inclusion or embedding, and in order to protect, you make it the static electricity according a bioactive substance to friction charged on the surface of a bioactive substance, and it is necessary to make an inclusion husks base material adsorb gradually like said fundamental plan using the husks substance in which these character is shown.

[0021] That is, on a preceding paragraph story, make a porosity inclusion husks base material adsorb, and carry out husks formation, calcium and starch particle [for elaboration] in a latter-part story are

made to adsorb further, and it is needed to make a bioactive substance include with a firm and precise shell structure object. Moreover, since the formed shell structure object is maintaining that structure according to electrostatic force, discharges and carries out embrittlement with time progress in this stage and collapses someday, after shell structure object formation needs that you make it solidify with an adhesive agent promptly.

[0022] furthermore, in performing this formation process under underwater The process dried [which dry and separates / which separates and dries formation particles] is needed after husks formation, and milk-serum protein, a shellac, a zein, etc. can be used as a coating agent, and when the substance included is an oily bioactive substance, the emulsifier for oil droplet formation and a thickener may also be used. this invention article is effective in the field of medicine, health food, food, and feed, and can use the features, such as a heat-resisting property, resistance to pressure, acid resistance, kneading-proof nature, a hygroscopic property, air interception nature, and intestinal juice soluble. Moreover, effect is taken also in respect of fortification.

[0023]

[Embodiment of the Invention] There are two kinds of manufacture methods of the bioactive substance enclosure particulates of this invention.

(1) the case where the bioactive substance included is a liquefied lipid -- a liquefied bioactive substance, water, and an emulsifier (a lecithin --) After supplying a sugar ester and a thickener (xanthan gum, guar gum) in a container, this solution is made to emulsify at 3,000rpm - 12,000rpm by a high-speed agitator, and an emulsification thing is obtained. In addition, although churning number of rotations changes with capacity of a container When container capacity is 10L, it is ** churning number of rotations. 8,000-12,000rpm** mixing time 10 minute [or more] ** liquefied bioactive substance: Water =5 - 20:70(bulk density) ** temperature 20-50 degree-C**pH It carries out under the conditions of 6.5-8.0.

[0024] Before electric discharge or coalescence of an oil droplet takes place temporally, static electricity adds gradually the calcium which performed porosity-ized processing promptly, and makes it stick to the oil droplet surface uniformly, if emulsion of the stable liquefied bioactive substance with which static electricity was fully charged on this condition is obtained.

[0025] Then, calcium [still particle in the purpose of stopgap and elaboration] (the powder of the mineralization thing of the seaweed origin containing milk-serum calcium, egg shell calcium, and calcium (henceforth the natural mineral material of vegetable origin) is added similarly, and adsorption treatment on the surface of an oil droplet is performed.) If husks-ization of a liquefied bioactive substance is made by the above-mentioned method, an adhesive agent will be added next. After making it dissolve beforehand, as for addition of an adhesive agent, adding gradually is desirable, but you may add with fine particles and the addition at the time of initial emulsification is sufficient. In order to carry out disintegration of the fixed particle structure, there are a spray drying process, the freeze-drying method, a reduced-pressure-drying method, a shelf type dry technique, a drum dryer dry technique, a centrifuge separation method, etc., but when the particle size distribution of powder products and mobility are taken into consideration, a spray drying process is desirable.

[0026] (2) When a bioactive substance was water solubility and a bioactive substance was water solubility, performing husks-ized processing in two steps found out the desirable thing. That is, adsorption cheats out of a water-soluble bioactive substance as the first step to the husks substance which performed porosity-ized processing beforehand (for example, under decompression). Then, dryness, pulverization, powder, and whole grain-ization are performed.

[0027] The second step makes an additional porosity substance stick to the husks substance which adsorbed the water-soluble above-mentioned bioactive substance electrostatically, adds microscopic particles, such as milk-serum calcium, for the purpose of stopgap and elaboration further, and adds and fixes an adhesive agent simultaneously. When a bioactive substance was oiliness, electrostatic adsorption was easy, but in the case of the water-soluble bioactive substance, it found out that it was more efficient to take the method of carrying out electrostatic adsorption completely after making a water-soluble bioactive substance adsorb for example, under decompression first as mentioned above.
[0028] [Work example 1] (when it applies to the vitamin E which is an oil-soluble bioactive substance) The result of having applied this invention is shown about vitamin E. Although disintegration was tried with the dextrin which is the conventional disintegration technology the place where the request of the disintegration of vitamin E is large, it turned out that attenuation of vitamin E is remarkable. Then, this invention was applied with the following three kinds of techniques. (Refer to Table 2) O material vitamin E Eisai Tea processing Extractant Polyglyceryl fatty acid ester by TAIYO KAGAKU CO., LTD., Zymolysis soybean lecithin by TAIYO KAGAKU CO., LTD. Xanthan gum by TAIYO KAGAKU CO., LTD., Natural polysaccharide by Dainippon Pharmaceutical Co., Ltd. Casein sodium made from Hayashibara Trading company, Japanese N ZETT M Py porosity calcium carbonate Product made from Shiroishi Calcium the pore cull N -- detailed milk-serum calcium Morinaga Milk Industry Co., Ltd. make Milk calcium 28EX vegetable origin natural mineral material Marigot Ltd. company make [0029] 4.0g of zymolysis soybean lecithins, xanthan gum 0.5g, 6.0g of natural polysaccharides, casein sodium 12.0g, and 7.5g of vitamin-C sodium salt are well mixed to 700.0g of purified water warmed to 140 degrees C of processes, and it agitated for 5 minutes and was made to fully distribute and dissolve at 6000rpm.
[0030] On the other hand, 1.3g of tea extractants and 1.3g of polyglyceryl fatty acid ester were fully mixed to 63.0g of vitamin E, and the suspension was prepared for it. The above-mentioned aqueous solution was made to distribute a vitamin-E suspension, high-speed churning during 10 minutes was carried out at 9000rpm, and emulsified liquid was prepared. Added one by one, agitating 136.3g of calcium carbonate [porosity / as a husks-ized base material], and detailed milk-serum calcium 68.2g at 6000rpm to the obtained emulsified liquid, it was made to fully distribute, and the vitamin-E oil droplet surface was made to carry out electrostatic adsorption. This solution was dried with the atomizer type spray dryer set as the following conditions, and 255g vitamin-E calcium powder was obtained.
[0031] Spray drying conditions [Table 1]

アトマイザ回転数(ｒｐｍ)	１８０００
入口温度(℃)	１８０
出口温度(℃)	９０
噴霧乾燥時間(min)	５分３７秒

[0032] The natural mineral material was used instead of detailed milk-serum calcium in process 2 process 1. That is, stock solution was prepared in the process 1 and this procedure using 68.2g of natural mineral materials of 136.3g of porosity calcium carbonate, and vegetable origin (more detailed than porosity calcium carbonate), and spray drying was carried out on these conditions.
[0033] Using 204.5g, only milk-serum calcium detailed as a process 3 (conventional method A) husks-

ized base material prepared stock solution in the process 1 and this procedure, and spray drying was carried out on these conditions. It is as follows when each composition of the above processes 1, 2, and 3 and a conventional method (the dextrin method: conventional method B) is made into a table.

[0034]

[Table 2]

製　法	1	2	従来法A	従来法B
ビタミンE	21.0	21.0	21.0	21.0
多孔質炭酸カルシウム	45.4	45.4	−	−
微細な乳清カルシウム	22.7	−	68.1	−
植物由来天然ミネラル素材	−	22.7	−	−
カゼインナトリウム	4.0	4.0	4.0	29.1
デキストリン	−	−	−	34.1
その他の原料	26.9	26.9	26.9	15.8
合　計	100.0	100.0	100.0	100.0

[0035] As a result of measuring the attenuation factor of vitamin E with a high speed liquid chromatography (Made by Shimadzu) about these, 0% of an attenuation factor and the process 3 (conventional method A) of processes 1 and 2 are 15% of attenuation factors, and the attenuation factor became 50% in the conventional method B. That is, it became clear that the attenuation factor of vitamin E was 0%, and the process 1 and process 2 which are this invention article had great difference compared with conventional methods A and B.

[0036] In addition, when the "pineapple flaw" (made by Matsutani Chemical Industry Co., Ltd.) which is a porosity dextrin was used, the attenuation factor of vitamin E was 0%. In the drying stage of dextrin solution, it is made to dry, considering it as the shape of a film and carrying out bumping, and this "pineapple flaw" is taken as porosity. Moreover, the "pore cull N" (product made from Shiroishi Calcium) which is porosity calcium carbonate calcinates limestone, considers it as quicklime, makes the carbon dioxide which generated the slaked lime milk which added water and was made at the time of calcination react, and makes the calcium carbonate of a uniform particle size generate.

[0037] [Work example 2] (when it applies to the glutathione which is a water-soluble bioactive substance) The following experiments were conducted on the case where the bioactive substance included is a water-soluble substance. For the glutathione as fish breeding feed, the glutathione persistence under severe conditions of the case where it is based on the method of this invention, and a conventional method was measured, and contrast to heat and the load of ** was performed.

Material water solubility bioactive substance : O Yeast MG (glutathione 3.163% content) Kohjin Selfer (porosity cellulose), Japanese Food-ized egg shell calcium (7 microns), In order to make yeast MG146.2 stick to Baccus trading company casein sodium, Japanese N ZETT M Py citric acid (anhydrous), the Jungbunzlauer Ges.m.b.HO method ****, and Selfer 50g, It was made to dissolve in 550ml of water, and decompressed for 3 minutes by -76cmHg. Then, it was made to dry at 50 degrees C with a shelf type drier for 18.5 hours. The mixer ground this and the whole grain was carried out by the 420-micrometer mesh.

[0038] The above-mentioned sample 174.3g was put into the granulation mixer, it agitated at 500rpm for 10 minutes, and static electricity was electrified on the sample particle surface. After electrification, Selfer 34.5g was added gradually, egg shell calcium 56.1g was added continuously, agitating at 500rpm, and it was made to adhere to the sample particle surface similarly. Next, agitating a side cutter at 2000rpm, in order to make the selfer and egg shell calcium which were made to adhere to the sample

particle surface adhere agitating at 500rpm, 60.6g of casein sodium aqueous solutions were dropped gradually, and granulation was carried out. Furthermore, acid treatment of 6.9g of the citric acid aqueous solutions was dropped and carried out. What was made was put into the shelf type drier set as 50 degrees C for 5 hours, and the whole grain was carried out by the 710-micrometer mesh. (EC-50MG is called hereafter.) In addition, the "selfer" which is a porosity cellulose is heat-treated and obtained, after carrying out neutral detergent processing of the testa of corn.
O To severe testing (thermal, ** load) mash, in order to fixed-ize the total glutathione concentration in a sample, the glutathione was added and it fully mixed so that it might become 4% and 2% about (0.063%) above-mentioned EC-50MG and Yeast MG, respectively. Addition mixture of the distilled water was carried out so that it might become 15% at this, and autoclave processing was carried out for 5 or 10 minutes (130 degrees C, 1.2kgf/cm2).
[0039] Each time zone 2 sample preparation was carried out. At-long-intervals heart separation of the suspension was carried out under 8000rpm and 4-degree C conditions for 10 minutes, and the supernatant liquid was extracted. The supernatant liquid did not have viscosity at light brown transparence. The supernatant liquid of each sample was extracted every [400micro / l], and it diluted with carrying out a scalpel rise 250 times to 100ml. The color of liquid turned into colorlessness by dilution. A fixed quantity of the total glutathione contents in each sample were carried out by the colorimetric measurement method using enzyme. The result is as follows.
[0040]
[Table 3]

	総グルタチオン濃度の平均(%)	理論濃度(%)	残存率(%)
酵母MG(5分)	0.055	0.063	86.9
酵母MG(10分)	0.048	0.063	76.6
EC-50MG(5分)	0.061	0.063	96.6
EC-50MG(10分)	0.054	0.063	85.5

[0041] As for EC-50MG (this invention article), also in 5 minutes, from Table 3, it was checked compared with Yeast MG that the glutathione remains highly intentionally also in 10 minutes. This has suggested strongly thermal and that significance is in EC-50MG (this invention article) about attenuation of the glutathione by ** load. Since inactivation of the glutathione at the time of feed processing tends to accelerate [tend] subsequent preservation and the attenuation at the time of feed intake, it is at the feed processing time, and it is very significant that 10% of difference was accepted. In addition, when the same experiment was conducted with ascorbic acid soda, it became clear that ascorbic acid soda was also significant to thermal load or ** load.
[0042] [Work example 3] (keeping quality examination) The inclusion husks base material of DHA content refining fish oil enclosure particulates was changed as follows, it saved in the state of a room temperature (25 degrees C) and opening, and temporal change of peroxide value was measured.
[0043]
[Table 4]

被験品	過酸化物価		
	開始前	15日後	44日後
乳清カルシウム	2.90	5.17	6.61
多孔質炭酸カルシウム	6.27	40.5	191
多孔質炭酸Ca+乳清Ca(1:2)	2.02	3.07	4.49
多孔質炭酸Ca+乳清Ca(2:1)	4.44	7.57	15.5

単位；meq/kg

[0044] The peroxide value of the case of the result of Table 4 to the porosity carbonic acid Ca+ milk serum Ca (1:2) is low most. That is, even if time passes, oxidization does not progress, but quality is stabilized, and the keeping quality shows the good thing. In addition, the measuring method of peroxide value was performed with the usual technique. Moreover, even if it uses together porosity carbonic acid Ca and a milk serum Ca, when the way of porosity carbonic acid Ca has many the ratios, it turns out that a not much good result is not obtained. About the ratio of porosity calcium carbonate and milk-serum calcium, when examined separately, the following results were brought. In addition, the examination neglected porosity husks in 40 degrees C and the state of 75% of humidity, and measured the peroxide value of three days after.

[0045]

[Table 5]

多孔質炭酸Ca；乳清Ca	当日POV値	3日後POV値
1 ; 5	2.90	2.30
2 ; 4	2.02	2.13
3 ; 3	2.50	3.60
4 ; 2	4.44	6.51
5 ; 1	5.21	7.02

POV；過酸化物価

That is, although 1:2 was the most desirable than the upper table as for the ratio of porosity carbonic acid Ca and a milk serum Ca, it became clear that you could be 1:1-1:5.

[0046] [Work example 4] (heating stability test) In order to examine heating stability, it examined with the following test method and subsequent progress was pursued by change of peroxide value.

O 40g of test method ** samples were paid to every two petri dishes about 15cm in diameter, respectively.

** With the drier, it reached for 10 minutes, and 190 degrees C of one side was heated for 30 minutes, and was neglected at the room temperature.

** Each peroxide value was immediately measured after radiationnal cooling. Moreover, after neglecting a part for four days as it was at a room temperature, it measured peroxide value. The result of heating is for 190 degrees C and 10 minutes as in Table 6.

[0047]

[Table 6]

被験品	過酸化物価		
	開始前	開始直後	4日放置後
多孔質炭酸Caのみ	6.72	6.42	7.38
多孔質炭酸Ca+乳清Ca(1:2)	1.25	検出限界以下	検出限界以下

Next, the result of heating is for 190 degrees C and 30 minutes as in Table 7.
[0048]
[Table 7]

被験品	過酸化物価		
	開始前	開始直後	4日放置後
多孔質炭酸Caのみ	6．72	43．59	54．52
多孔質炭酸Ca＋乳清Ca(1：2)	1．25	検出限界以下	検出限界以下

[0049] [if the result of Table 6 and 7 is seen, peroxide value will become large as a husks substance passes through time in the case of porosity carbonic acid Ca, but] When a husks substance is the porosity carbonic acid Ca+ milk serum Ca (1:2), even if time passes since immediately after a start, peroxide value is below a detection limit, and even if it heats, it turns out that it did not oxidize but is stable.
[0050] [Work example 5] (application to a bread) On a group the result of work examples 1 and 2 as an inclusion husks base material Porosity calcium carbonate: As contrasted with the case where the DHA content refining fish oil which does not carry out enclosure processing is added, the sensory test was carried out about the bread which added the DHA content refining fish oil enclosure particulates (henceforth NSC-4) which use milk-serum calcium =1:2.
O Preparation NSC-4 of bread were mixed to 30-times the amount wheat flour, 5g of salt, 17.5g of very-refined sugar, Butter 20g, skim milk 5g, dry yeast 2.7g, and 190ml of water were added and kneaded, and it was made to ferment at 40 degrees C for 60 minutes. The obtained baker's dough was breathed, 200 degrees C was overheated after forming fermentation for 25 minutes, and bread was calcinated. The result is shown below. The panelist carried out by a total of 15 persons of six men and nine women.
A: Bread which added the bread B:DHA content refining fish oil (27% of DHA content) which added NSC-4 3% to wheat flour 0.44% to wheat flour [0051]
[Table 8]

	A	B	検定
型(外観)の好ましい方	13	2	＊＊
色艶の好ましい方	12	3	＊
皮質の好ましい方	9	6	－
きめ立ちの好ましい方	10	5	－
内色相の好ましい方	9	6	－
香気の好ましい方	12	3	＊
風味の好ましい方	12	3	＊
触感の好ましい方	12	3	＊
食感の好ましい方	12	3	＊
総合的評価(好ましい方)	13	2	＊＊

＊＊：有意水準1％有意

＊：有意水準5％有意

[0052] Although the taste difference was not accepted about a cortical layer, texture ****, and an inside hue from the above result About glow, an aroma, flavor, tactile feeling, and taste, it was 5% of a significance level, and about a mold and synthetic evaluation, although the significant difference was accepted by 1% of the significance level and the direction of A added NSC-4 rather than B, it turned out that the way is liked.

[0053] There were the badness and "******" of fishiness peculiar to fish oil or aftertaste, stickiness was found also about tactile feeling, and what does not carry out NSC processing was not desirable. Moreover, when there was the heterogeneous smell and having been reheated also about the smell, the smell became tight more. A feeling of a **** rate had come out compared with what is not added, and the direction which added NSC-4 on the other hand was popular. In addition, although the thing given in the above-mentioned work example was the bread which added NSC-4 3% to wheat flour, the good result was obtained when carried out also about addition 4%, 5%, and 10%.

[0054]

[Effect of the Invention] By this invention, the high porosity husks of a heat-resisting property, resistance to pressure, and kneading-proof nature can be formed, use of a bioactive substance can be closed if , and utility value can be raised in the field of medicine, health food, and feed.

[Translation done.]